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BEAM ATTENUATION COEFFICIENTS IN THE SOUTH ATLANTIC: INDICATOR OF OCEANIC PROCESSES

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Final Report

RESEARCH GOALS: The ultimate goal of this research is to obtain global, distributions of beam attenuation coefficients throughout the water column. This optical measurement will be correlated with particle concentrations to determine particle distributions and interpret oceanic processes responsible for those distributions.

OBJECTIVE: The objective of this proposal was to obtain an ocean-wide, three-dimensional distribution of beam attenuation coefficients in the south Equatorial Atlantic during the South Atlantic Ventilation Experiment (SAVE). These data are being correlated with particle and hydrographic parameters in order to interpret oceanic processes.

APPROACH: Funds from this contract were used to interface a Sea Tech 25 cm transmissometer (660 nm light source) with the Scripps CTD to obtain profiles of beam attenuation coefficient. Through NSF funding water samples throughout the water column were filtered to determine dry weights of filtered particles and size distribution by analysis with a Coulter Multisizer. Empirical calibrations of attenuation coefficients then make it possible to map the particle concentrations throughout the water column.

TASKS COMPLETED: During three transects across the South Atlantic during the SAVE project, we obtained 159 profiles between November, 1987- March 1988.

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SCIENTIFIC RESULTS: The highest particle concentrations are in surface waters. Regionally, the zone of enhanced primary production due to equatorial upwelling is easily identified from the optically determined particle concentrations. The oxygen minimum, which is particularly strong along the African margin at 10 degrees south, is clearly associated with a slight increase in optically determined particle concentration. Whether the increase in particles in the oxygen minimum is an advective feature or results from in-situ production of particles (e.g. bacteria) has not been determined. Bottom nepheloid layers were observed only at three or four stations along the western boundary between 4000 and 4500 m, but they were of very low intensity. Otherwise, optically determined particle concentrations were extremely uniform below 500 m, although the deep waters west of the mid-Atlantic Ridge were slightly lower in particle concentration than those east of the ridge.

ACCOMPLISHMENTS: We have demonstrated that transmissometers can be interfaced with a CTD in a routine manner to make a rapid optical survey of the distribution of particulate matter in the ocean with continuous profiles. These data indicate where oceanic processes such as primary biological production and resuspension of bottom sediments are active on time and space scales not possible to map through discrete water sampling.

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